Dzero Experimental Area

Emergency Backup Power and Generator Test

1/24/91

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EN3740.510-EN-278

D0 EMERGENCY POWER TEST PROCEDURE

1. Warn D0 inhabitants of impending power outage.
2. Cryo will ensure that all the emergency power loads are running.
   I/A compressor, IV pump, UV pump, IV blower, ventilation, UPS, drier.
3. Electricians shut down commercial power to DAB.
4. Electricians observe:
   a. Start of emergency generators.
   b. Transfer of power to grid.
   c. Operation of generators under load.
5. Cryo observes:
   a. Operation of the control system.
   c. Restart of (check rotation).

I. Ventilation equipment.	Auto Restart
II. U.P.S. inverter off.	Auto Restart
III. I/A compressor.	Auto restart
IV. Mechanical pump 1.	Delayed Auto Restart
V. Mechanical pump 2.	Delayed Auto Restart
VI. IV blower.	Auto Restart
VII. I/A driers.	Auto Restart
VIII. Glycol pumps and cooling tower fan.	Auto Restart

6. Leave emergency generator on for 30 minutes or until all of the above is completed.
7. Electricians reestablish commercial power to DAB.
8. Electricians observe:
   a. The transfer back to Comercial power.
   b. The generator shutdown.
9. Cryo observes:
   a. Operation of the control system.
   c. Restart of

I. Ventilation equipment.	Auto Restart
II. U.P.S. inverter off.	Auto Restart
III. I/A compressor.	Auto restart
IV. Mechanical pump 1.	Delayed Auto Restart
V. Mechanical pump 2.	Delayed Auto Restart
VI. IV blower.	Auto Restart
VII. I/A driers.	Auto Restart
VIII. Glycol pumps and cooling tower fan.	Auto Restart

END.

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D0 EMERGENCY GENERATOR AND U.P.S. TEST NOTE

Overview: The D0 experimental area has a generator designated as emergency power. This generator provides power for critical loads and starts automatically upon loss of commercial power. This note concerns the testing of this generator. A list of loads is attached to this note.

One of the loads on the emergency power grid is a 10KVA Uninterruptible Power Supply(UPS). The UPS powers the cryogenic controls and Oxygen Deficiency Hazard equipment(ODH) and has a minimum rating of 20 minutes while on its batteries(to cover the transfer time to/from the emergency generator).

Jan 23, 1991 at 1640 hrs this system was tested under the supervision of the Terry Ross, Marv Johnson, Dan Markley, Kelly Dixon, and John Urbin.

Test: The power feeder to the emergency power grid at D0 was disconnected. The generator responded immediately and was supplying power to the emergency power grid in less than 10 seconds.

During the 10 seconds that there was no power on the emergency grid, the UPS switched on its inverter and provided uninterrupted power to the cryogenic control system and the ODH system. All of the motorized equipment shut off (instrument air compressor, vacuum pumps 1 and 2, insulating vacuum blower, glycol cooling pumps, cooling tower fan, and Exhaust Fan7(EF7).

Upon reengagement of power to the grid from the emergency generator, all of the motorized loads started back up with the exception of vacuum pumps 1 and 2, and the UPS inverter turned off. Vacuum pumps 1 and 2 were delay started 20 seconds by the cryogenic control system as not to cause too large of a surge in power by all of the inductive loads starting at once. The D0 building elevator which is also on emergency power was test run while the emergency generator was on line with all other emergency loads.

The emergency generator current was 140 amps with all loads on line and running except the building elevator. This load of 140 amps is 27% of the generator's capacity.

Cryogenic Controls: The cryogenic control and ODH system continued to function properly throughout the entire test due to the UPS responding correctly to each power situation.

The cryogenic control system isolated both the Utility(UV) and insulating(IV) vacuum systems as to preserve their vacuums while the pumps were off. Once the vacuum pumps were reestablished the IV and UV vacuums were put back on line to their respective pumps by the cryogenic control system.

The instrument air is backed up by a high pressure trailer, regulated down to instrument air pressure and switches automatically on line throughout a check valve. During the time that the instrument air compressor was off, instrument air never went below 80 psig(high pressure regulator setting).

Specifications:

UPS-	Output volts:	208 vac
	Output power:	10 kva
	Reserve time(min):	20 mins @ full load
Emergency Generator-	Output volts:	480 vac
	Output power:	250 kva
	Output amps:	520 amps
Emergency Air-	Storage pressure:	1100-2000 psig
	Regulated output: 80 psig	
	Reserve time(min):	4 hrs @ 100 scfm(full load)

Test Conclusion: The members of this testing group agree that the test of the emergency power and backup power system at D0 was a success. All of the equipment operated exactly as predicted and met the current requirements set forth.

We do recommend that a test where commercial power to the entire building is disconnected to simulate a real power outage, is performed. The only part of the emergency system not tested was the emergency lighting. The lights that are on emergency power probably worked, however when all the lights are on you can't discriminate between emergency power and commercial power. This test would prove that the emergency lighting works properly.

D.M. 1/24/91

Emergency Power Survey
April 19, 1989

Cryoequipment

ITEM	Power Requirement	Provision
I/A Compressor	480V/3ph/19KVA	EP
Air Dryer	277VAC/8KVA	EP
Rough Vac. Pump	480V/3ph/8.5KVA	EP
Insul. Vac. Pump	480V/3ph/8.5KVA	EP
Vacuum Blower	480V/3ph/4KVA	EP
Diffusion Pump	120VAC/1.5KVA	EP
Water Cooling Pump and Fan	480V/3ph/3KVA	EP
TOTAL	480V/3ph/52.5KVA	EP

Cryocontrols	4.7KVA*
Cryoequipment	52.5KVA
GRAND EP TOTAL	57.9KVA*

Emergency Power, UPS Survey
April 19,1989
Cryo Controls

Item	**Power Requirement**	**Provision**
PLC (TI565)	120 VAC/350VA	UPS/EP
AST286 (2 each)	120 VAC/600VA	UPS/EP
Multisync II (2 each)	120 VAC/184VA	UPS/EP
Epson FX850	120 VAC/180VA	UPS/EP
Miscellany	120 VAC/300VA	UPS/EP
24V PS	120 VAC/900VA	UPS/EP
I/O Base I	120 VAC/250VA	UPS/EP
I/O Base II	120 VAC/250VA	UPS/EP
I/O Base III	120 VAC/250VA	UPS/EP
ODH Monitors	120 VAC/360VA	UPS/EP
Vacuum R/O	120 VAC/360VA	UPS/EP
Level Gage	120 VAC/360VA	UPS/EP
Other Instruments	120 VAC/360VA	UPS/EP
Total	**120 VAC/43.7KVA**	**UPS/EP**